

**Claims:**

1. A system for implementing Incremental Redundancy (IR) operations in a wireless receiver comprising:

a baseband processor that is operable to receive analog signals corresponding to a data block and to sample the analog signal to produce samples;

an equalizer that is operable to receive the samples from the baseband processor, to equalize the samples, and to produce soft decision bits of the data block;

a system processor that is operable to receive the soft decision bits and to initiate IR operations; and

an IR processing module operably coupled to the system processor that is operable to receive the soft decision bits and to perform IR operations on the soft decision bits.

2. The system of claim 1, wherein the system processor is operable to decode the soft decision bits to produce a decoded header for the data block.

3. The system of claim 1, wherein the IR processing module is operable to decode the soft decision bits to produce a decoded header for the data block.

4. The system of claim 1, wherein in performing IR operations:  
a Modulation and Coding Scheme (MCS) mode and puncturing pattern of the data block is determined;

the soft decision bits are deinterleaved;

the soft decision bits are depunctured to produce depunctured soft decision bits; and

the IR processing module is operable to decode the depunctured soft decision bits.

5. The system of claim 1, wherein when the IR operations are unsuccessful, the soft decision bits of the data block are stored in IR memory.

5 6. The system of claim 5, wherein during IR operations on a subsequently received copy of the data block:

a determination is made that a Modulation and Coding Scheme (MCS) mode and puncturing pattern of the subsequently received copy of the data block and a MCS mode of the data block are compatible;

10 soft decision bits of the subsequently received copy of the data block are combined with soft decision bits of the data block to produce combined soft decision bits;

the combined soft decision bits are depunctured; and

the IR processing module decodes the depunctured combined soft decision bits.

15 7. The system of claim 5, wherein during IR operations on a subsequently received copy of the data block:

a determination is made that a Modulation and Coding Scheme (MCS) mode of the subsequently received copy of the data block and a MCS mode and puncturing pattern of the data block are compatible;

20 the soft decision bits of the data block are depunctured to produce first depunctured soft decision bits;

the soft decision bits of data of the subsequently received copy of the data block are depunctured to produce second depunctured soft decision bits;

the first depunctured soft decision bits and the second depunctured soft decision bits are combined to produce combined depunctured soft decision bits; and

the IR processing module is operable to decode the combined depunctured soft decision bits.

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8. The system of claim 1, wherein the IR processing module operates as a slave to the system processor.

9. The system of claim 1, wherein:

10 the system processor interfaces with the IR processing module via a plurality of registers; and

the IR processing module asserts an interrupt to the system processor to indicate the completion of a processing task.

15 10. The system of claim 1, wherein the system supports Modulation and Coding Scheme (MCS) modes of the GSM EDGE standardized protocol.

11. The system of claim 1, further comprising IR memory including Type I IR memory and Type II IR memory, wherein control information is stored in Type I IR memory  
20 and soft decision bits are stored in Type II IR memory.

12. The system of claim 11, wherein either punctured soft decision bits or depunctured soft decision bits may be stored in each Type II IR memory location.

13. The system of claim 1, wherein the data block may include a complete Radio Link Control (RLC) block or a segmented RLC block.

5 14. A system for implementing Incremental Redundancy (IR) operations in a wireless receiver comprising:

at least one processing device that is operable to receive an analog signal corresponding to a data block, to sample the analog signal to produce samples, to equalize the samples, to produce soft decision bits of the data block, and to initiate IR operations; and

10 an IR processing module operably coupled to the at least one processing device that is operable to receive the soft decision bits and to perform IR operations on the soft decision bits.

15 15. The system of claim 14, wherein the at least one processing device is operable to decode the soft decision bits to produce a decoded header for the data block.

16. The system of claim 14, wherein the IR processing module is operable to decode the soft decision bits to produce a decoded header for the data block.

17. The system of claim 14, wherein in performing IR operations:  
20 a Modulation and Coding Scheme (MCS) mode and puncturing pattern of the data block is determined;

the soft decision bits are depunctured to produce depunctured soft decision bits; and  
the IR processing module is operable to decode the depunctured soft decision bits.

18. The system of claim 14, wherein when the IR operations are unsuccessful, the soft decision bits of the data block are stored in IR memory.

19. The system of claim 18, wherein during IR operations on a subsequently  
5 received copy of the data block:

a determination is made that a Modulation and Coding Scheme (MCS) mode and puncturing pattern of the subsequently received copy of the data block and a MCS mode and puncturing pattern of the data block are compatible;

soft decision bits of the subsequently received copy of the data block are combined with  
10 soft decision bits of the data block to produce combined soft decision bits;

the combined soft decision bits are depunctured; and

the IR processing module decodes the depunctured combined soft decision bits.

20. The system of claim 18, wherein during IR operations on a subsequently  
15 received copy of the data block:

a determination is made that a Modulation and Coding Scheme (MCS) mode of the subsequently received copy of the data block and a MCS mode of the data block are compatible;

the soft decision bits of the data block are depunctured to produce first depunctured soft  
20 decision bits;

the soft decision bits of data of the subsequently received copy of the data block are depunctured to produce second depunctured soft decision bits;

the first depunctured soft decision bits and the second depunctured soft decision bits are

combined to produce combined depunctured soft decision bits; and

the IR processing module is operable to decode the combined depunctured soft decision bits.

5           21.    The system of claim 14, wherein the IR processing module operates as a slave to the at least one processing device.

          22.    The system of claim 14, wherein:  
          the at least one processing device interfaces with the IR processing module via a  
10   plurality of registers; and  
          the IR processing module asserts an interrupt to the at least one processing device to indicate the completion of a processing task.

          23.    The system of claim 14, wherein the system supports Modulation and Coding  
15   Scheme (MCS) modes of the GSM EDGE standardized protocol.

          24.    The system of claim 14, further comprising IR memory including Type I IR memory and Type II IR memory, wherein control information is stored in Type I IR memory and soft decision bits are stored in Type II IR memory.

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          25.    The system of claim 24, wherein either punctured soft decision bits or depunctured soft decision bits may be stored in each Type II IR memory location.

26. The system of claim 14, wherein the data block may include a complete Radio Link Control (RLC) block or a segmented RLC block.

27. A method for performing Incremental Redundancy (IR) operations in a wireless receiver comprising:

receiving an analog signal corresponding to a data block;

sampling the analog signal to produce samples;

equalizing the samples to produce soft decision bits of the data block;

transferring the soft decisions of the data block to an IR processing module; and

the IR processing module receiving the soft decision bits of the data block and performing IR operations on the soft decision bits of the data block in an attempt to correctly decode the data block.

28. The method of claim 27, wherein the IR operations include:

decoding the soft decision bits of the data block to produce a decoded header; and

determining a Modulation and Coding Scheme (MCS) mode and puncturing pattern of the data block from the decoded header;

depuncturing the soft decision bits of the data block based upon the MCS mode and puncturing pattern to produce depunctured soft decision bits; and

the IR processing module decoding the depunctured soft decision bits.

29. The method of claim 28, wherein the IR processing module performs the depuncturing operations.

30. The method of claim 27, further comprising:

failing to correctly decode the soft decision bits of the data block;

storing the soft decision bits of the data block in an IR memory;

receiving a new copy of the data block;

5 determining that a Modulation and Coding Scheme (MCS) mode of the data block and a MCS mode of the new copy of the data block are compatible;

combining soft decision bits of the new copy of the data block with soft decision bits of the data block to produce combined soft decision bits; and

the IR processing module decoding the combined soft decision bits.

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31. The method of claim 30, further comprising:

failing to correctly decode the combined soft decision bits; and

storing the combined soft decision bits in an IR memory.

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32. The method of claim 30, wherein combining soft decision bits of the new copy of the data block with soft decision bits of the data block to produce combined soft decision bits comprises combining punctured soft decision bits when:

a MCS mode of the data block is the same as a MCS mode of the new copy of the data block; and

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a puncturing pattern of the data block is the same as a puncturing pattern of the new copy of the data block.

33. The method of claim 30, wherein combining soft decision bits of the new copy



of the data block with soft decision bits of the data block to produce combined soft decision bits comprises:

depuncturing the soft decision bits of the data block to produce first depunctured soft decision bits;

5       depuncturing the soft decision bits of the new copy of the data block to produce second depunctured soft decision bits; and

combining the first depunctured soft decision bits with the second depunctured soft decision bits to produce the combined soft decision bits.

10       34.     The method of claim 27, wherein:

each symbol of the data block is represented by four punctured soft decision bits; and

each symbol of the data block is also represented by five depunctured soft decision bits.